WHAT IS CLAIMED IS:

1. A pelletizing die, comprising a pelletizing die member with a die exit side exposed to cooling fluid and a die entry side for receiving polymer fed thereto, the pelletizing die member comprising:

a plurality of polymer channels;

a plurality of extrusion orifices connected to a respective one of said polymer channels to form a extrusion orifice section;

heating medium conduits forming a heating medium system, said heating medium conduits including at least one conduit adjacent to each polymer channel for heating the polymer channel; and

a thermal stabilization cavity adjacent to each extrusion orifice in an associated one of said extrusion orifice sections, said thermal stabilization cavity defining a thermal stabilization zone between said die exit side exposed to cooling fluid and said heating medium conduits allowing the polymer to remain in a liquid state up to solidification just as the polymer exists the extrusion orifice.

2. A pelletizing die according to claim 1, wherein said thermal stabilization cavity includes a space surrounding each extrusion orifice section at a location inwardly of said die exit side to provide thermal stabilization from the cooling effects of the cooling fluid.

3. A pelletizing die according to claim 1, wherein said thermal stabilization cavity includes a space extending between each extrusion orifice section at a location inwardly of said die exit side to provide thermal stabilization from the cooling effects of the cooling fluid.

4. A pelletizing die according to claim 1, wherein said thermal stabilization cavity includes a space extending substantially circumferentially between each extrusion orifice section at a location inwardly of said die exit side to provide thermal stabilization from the cooling effects of the cooling fluid.

5. A pelletizing die according to claim 1, wherein said thermal stabilization cavity includes a space extending substantially radially between each extrusion orifice within each extrusion orifice section at a location inwardly of said die exit side to provide thermal stabilization from the cooling effects of the cooling fluid.

6. A pelletizing die according to claim 1, wherein said thermal stabilization cavity is filled with a heat transfer media that provides good heat transfer characteristics.

7. A pelletizing die according to claim 1, wherein said thermal stabilization cavity transports heat through a convective, radiative and conductive medium.

8. A pelletizing die, comprising a pelletizing die member with a die exit side exposed

to cooling fluid and a die entry side for receiving polymer fed thereto, the pelletizing die member comprising:

a plurality of polymer channels;

a plurality of extrusion orifices connected to a respective one of said polymer channels to form an extrusion orifice section;

heating medium conduits forming a heating medium system, said heating medium conduits including at least one conduit adjacent to each polymer channel for heating the polymer channel; and

a polymer channel to extrusion orifice transition zone to prevent melt-fracture including a polymer channel connected to each of said extrusion orifices taking into account specific polymer characteristics with appropriate geometries, pressures, and flow rates that will allow maximum production and eliminate melt fracture of the particular polymer and assure the proper thermal transition of the polymer for maximum pellet quality.

9. A method for pelletizing comprising the steps of:

providing a pelletizing die member with a die exit side exposed to cooling fluid and a die entry side for receiving polymer fed thereto, the pelletizing die member comprising:

providing a plurality of polymer channels;

providing a plurality of extrusion orifices associated with a respective one of said channels to form a extrusion orifice section;

circulating heating medium through conduits forming a heating medium system, said

heating medium conduits including at least one conduit adjacent to each polymer channel for heating the polymer channel; and

forming a polymer channel to extrusion orifice transition zone to prevent melt-fracture including a polymer channel connected to each of said extrusion orifices by taking into account specific polymer characteristics by providing:

a geometric relationship based on computational fluid dynamics modeling;

supplying of polymer based on the geometric relationship to obtain pressures at flow rates based on computational fluid dynamics modeling that will allow maximum production and eliminate melt fracture of the particular polymer and assure the proper thermal transition of the polymer for maximum pellet quality.

045 ~~10.~~ A pelletizing die, comprising a pelletizing die member with a die exit side exposed to cooling fluid and a die entry side for receiving polymer fed thereto, the pelletizing die member comprising:

a plurality of polymer channels;

a plurality of extrusion orifices connected to a respective one of said polymer channels at an extrusion orifice transition zone to form an extrusion orifice section;

a heating medium system with a heating medium conduit adjacent to each polymer channel for heating the polymer channel including a transition zone conduit between adjacent channels and adjacent to the transition zone of each of said extrusion orifices for heating polymer in each extrusion orifice.

1045 11. A pelletizing die according to claim 10, wherein said heating medium system includes a heating medium conduit radially outwardly of each extrusion orifice section and adjacent to each of said channels.

allow explain how ext. orifice section ~~dog~~ interpreted

allow 12. A pelletizing die according to claim 10, wherein said heating medium system includes a heating medium conduit radially inwardly of each extrusion orifice section and adjacent to each of said channels.

1045 13. A pelletizing die according to claim 10, wherein said heating medium system includes another heating medium conduit between adjacent channels.

14. A pelletizing die according to claim 10, wherein said heating medium system includes a supply heating medium conduit radially outwardly of each extrusion orifice section and adjacent to each of said channels, said supply heating medium conduit being connected to said transition zone conduits for supplying heating medium to said transition zone conduits, additional heating medium conduits between adjacent channels and an intermediate heating medium conduit radially inwardly of each extrusion orifice section and adjacent to each of said channels, said intermediate heating medium conduit being connected to said transition zone conduits and being connected to said additional heating medium conduits for transferring heating medium between said transition zone conduits and said additional heating medium conduits for even heat distribution to the polymer based on once in and once out heating

medium flow.

15. A pelletizing die according to claim 14, wherein said supply conduit is an inlet header extending circumferentially about said polymer channels to provide essentially equal pressure and flow to the entry of each of said transition zone channels and with a discharge header extending circumferentially about said polymer channels and connected to each of said additional channels, said discharge header having a geometry to provide equal flow and pressure drop across each of said additional channels.

16. A pelletizing die according to claim 10, further comprising:

a thermal stabilization cavity adjacent to each extrusion orifice in an associated said extrusion orifice section, said thermal stabilization cavity defining a thermal stabilization zone between said die exit side exposed to cooling fluid and said heating medium conduits allowing the polymer to remain in a liquid state up to solidification just as the polymer exists the extrusion orifice.

17. A pelletizing die, comprising a pelletizing die member with a die exit side exposed to cooling fluid and a die entry side for receiving polymer fed thereto, the pelletizing die member comprising:

a plurality of polymer channels;

a plurality of extrusion orifices connected to a respective one of said polymer channels

to form a extrusion orifice section;

heating medium conduits forming a heating medium system, said heating medium conduits including at least one conduit adjacent to each polymer channel for heating the polymer channel;

a raised extrusion orifice ring encompassing said extrusion orifice sections; and

a hard face coated onto said raised extrusion orifice ring face, said hard face having a thickness of less than 1mm. and having a hardness level greater than 800 HVO1.

18. A pelletizing die according to claim 17, further comprising:

a thermal stabilization cavity adjacent to each extrusion orifice in an associated said extrusion orifice section, said thermal stabilization cavity defining a thermal stabilization zone between said die exit side exposed to cooling fluid and said heating medium conduits allowing the polymer to remain in a liquid state up to solidification just as the polymer exists the extrusion orifice.

19. A pelletizing die, comprising:

a pelletizing die member with a die exit side exposed to cooling fluid and a die entry side for receiving polymer fed thereto;

a extrusion orifice ring with a hard facing;

a brazed bond connecting said extrusion orifice ring to said pelletizing member;

a plurality of thermal stabilization cavities defined by said extrusion orifice ring and said

pelletizing die member, upon brazing said extrusion orifice ring to said pelletizing die member.

20. A pelletizing die according to claim 19, wherein said brazed bond connection between said pelletizing die and said extrusion orifice ring is formed in an oven at a temperature between 900° C and 1,200° C, under vacuum in a furnace, said furnace being flushed with argon gas during heating and or cooling of said pelletizing die and said extrusion orifice ring for avoiding oxidation of said pelletizing die and said extrusion orifice ring as well as for the acceleration of heating and or cooling of said pelletizing die and said extrusion orifice ring, and where said temperature between 900° C and 1,200° C at which said pelletizing die and said extrusion orifice ring are brazed together, is based on a temperature at which said pelletizing die and said extrusion orifice ring are to be heat treated subsequent to brazing.

21. A pelletizing die according to claim 19, wherein said pelletizing die forming a brazed assembly with said extrusion orifice ring is as a whole heat treated by a process comprising heating, holding at solution heat treatment temperature for a period of time, intermediate heat treatment, tempering and cooling down.

22. A pelletizing die according to claim 19, wherein said plurality of thermal stabilization cavities formed by brazing of said extrusion orifice ring to said pelletizing die are formed with an advantageous entrained vacuum within said plurality of thermal stabilization cavities as a result of brazing in an oven under vacuum.